Nutrition Guide for Bobwhite Quail Production

THE UNIVERSITY OF GEORGIA
COOPERATIVE EXTENSION
Colleges of Agricultural and Environmental Sciences & Family and Consumer Sciences

Nutrition Guide for Bobwhite Quail Production

W.A. Dozier III, K. Bramwell, C. Dunkley
Extension Poultry Scientists

Bobwhite quail need proper nutrition for growth, bone formation, feather development and health. Nutritionally adequate diets include the following components: water, protein, carbohydrates, fats, minerals and vitamins. Each nutrient serves specific functions and must be adequately provided by the diet to promote tissue growth and maintenance.

Nutrients

Water

The most important nutrient is water. Bobwhite quail need water for temperature regulation, waste removal, nutrient digestion and joint lubrication. Water deprivation can cause weight loss, dehydration and, ultimately, death. A good rule of thumb is that birds consume about twice as much water as feed on a weight basis. During times of high environmental temperatures, water intake may be four times greater than feed consumption. The quality of the water source is also of great importance. Water quality guidelines are listed in Table 1.

Table 1. Water quality recommendations [A]

Item	Average Level	Maximum Level
Total bacteria	0/ml	100/ml
Coliform bacteria	0/ml	50/ml
PH	6.8-7.5	. . .
Chloride	14 mg/l	250 mg/l
Copper	0.002 mg/l	0.60 mg/l
Iron	0.2 mg/l	0.3 mg/l
Lead	. . .	0.02 mg/l
Nitrate	10 mg/l	25 mg/l
Nitrite	0.4 mg/l	4 mg/l
Sodium	32 mg/l	. . .
Sulfate	125 mg/l	250 mg/l
Zinc	. . .	1.50 mg/l

[A] Adapted from Drinking Water Quality for Poultry. North Carolina Agricultural Extension Service, PS & T Guide No. 42.

Protein

Proteins are used to form meat, feathers, eggs, blood, hormones and immune response. They consist of small compounds called amino acids. Amino acids contain nitrogen, hydrogen, carbon and oxygen; some have sulfur. Quail use 20 different amino acids to maintain physiological functions, but the body can produce only 10 of these amino acids. The other 10 must be supplied by the diet to support adequate growth and development. Dietary protein sources typically used to meet amino acid/protein requirements include soybean meal, corn-gluten meal, meat and bone meal, poultry by-product meal and canola meal.

Carbohydrates

Carbohydrates include sugars, starch, cellulose and gums. They supply the bird with a source of starch and simple sugars. Some grain sorghum varieties, however, contain anti-nutritional factors such as tannins, which reduce the utilization of protein. Avoid varieties of grains that contain anti-nutritional factors.

Information on pearl millet is limited, but it appears to have promise as an energy source feed ingredient. Bobwhites prefer millet to other grains.

Fats

Fats have a higher energy concentration than carbohydrates and are also needed for absorbing fat-soluble vitamins. Fat sources have a tendency to undergo oxidation, become rancid and destroy the activity of vitamins. Add an antioxidant to the fat source to minimize oxidation.

Minerals

Minerals are the inorganic elements remaining when a feedstuff is burned. The animal's body consists of approximately 3-5 percent ash on a dry basis. Calcium and phosphorus account for about 75 percent of the total mineral content of ash. Mineral deficiency symptoms in quail include bone disorders, decreased egg production, thin-shelled eggs, reduced growth, poor feather development and anemia. The essential minerals needed for growth and production are classified as either macro or micro, based on the amount required in the diet. Macro minerals include calcium, phosphorus, sodium, chloride, potassium and magnesium, which are needed in relatively large amounts. Micro minerals include manganese, zinc, iron, copper, iodine, molybdenum and selenium.

Vitamins

Vitamins are organic compounds required in low concentrations for growth and reproduction. Vitamin deficiency symptoms include reduced bone formation, decreased egg production and hatchability, fatty liver and kidney degeneration. Vitamins are classified as either fat-soluble or water-soluble. Fat-soluble vitamins include A, D, E and K; the B vitamins, choline and vitamin C are water-soluble.

Diet Formulation

Plantation customers demand well-feathered, lean and flighty Bobwhite quail. Nutrition can impact these essential characteristics. The Bobwhite quail doubles its weight every four days during the first couple of weeks, and during this time the chick needs nutrients for feather formation, bone development and tissue growth. Proper feather development is dependent on adequate protein consumption, because feathers are primarily composed of protein. A protein deficiency in the feed can cause poor feather development. Hot temperatures can decrease feed consumption by 20 percent, which can also lead to poor feather development, increased disease susceptibility and poor growth rate if the feed does not contain an adequate amount of nutrients.

A protein deficiency is more likely to occur during summer because high environmental temperatures often decrease feed consumption. Other production factors such as high pen density and infectious diseases can also limit feed consumption. One strategy to compensate for reduced consumption is to feed high-protein diets. Marketing lean birds is also paramount to game bird producers; overweight quail are often lethargic. Providing a diet rich in protein relative to energy can help minimize obesity.

Unfortunately, experimental data are limited on the nutrient requirements for Bobwhite quail. Field experiences, however, have provided valuable information regarding nutrition. Researchers from North Carolina State University have determined that providing Bobwhite quail a starter feed containing 28-30 percent protein should be adequate to maintain proper feather development, livability and body weight gain.

Feeding Bobwhite quail a starter feed formulated to contain higher than 30 percent protein is unnecessary unless the birds are experiencing a significant reduction in feed consumption since more than 30 percent protein is not used by the bird. As a general rule, feed cost can be directly proportional to protein content, so feeding high-protein feeds that exceed the birds' protein/amino acid requirements can be costly.

Table 2 provides the ingredient and nutrient composition of six suggested diets for Bobwhite quail from hatching until marketing. These diets are intentionally higher in crude protein and methionine than typical commercial Bobwhite quail diets to minimize inadequate protein consumption and to compensate for nutrient variation in feed ingredients. Game bird producers should feed a sequence of these six diets during production.

For example, birds may be fed a 30 percent crude protein diet for the first six weeks, a 26 percent crude protein diet from seven to 12 weeks, then a 22 percent crude protein diet during the last few weeks. Factors such as environmental temperature and disease outbreak may warrant feeding a starter feed of 32 percent crude protein, grower feed of 28 percent crude protein and final feed of 24 percent crude protein. Using a feeding program consisting of more than three feeds will allow a grower to reduce feed costs, but may not be practical from the standpoint of labor demands with mixing feed or having an adequate amount of storage.

Diets are also presented for breeders producing hatching eggs (Table 3). These diets were formulated to contain either sufficient (24 percent) or high (28 percent) crude protein content. During situations of reduced feed intake, the diet containing 28 percent crude protein would be more appropriate to avoid reductions in fertility and hatchability.

Table 2. Composition of diets recommended for Bobwhite quail reared for game-release

Ingredients, % "AS-IS"	Starter (1)	Starter (2)	Grower (1)	Grower (2)	Finisher (1)	Finisher (2)
Corn, 8.5% CP	34.59	39.86	44.78	49.73	54.66	59.62
Soybean meal, 48.5% CP	59.45	54.40	49.47	44.47	39.62	34.61
Limestone	1.88	1.63	1.64	1.65	1.70	1.71
Biofos (Dicalcium Phosphate)	1.49	1.52	1.55	1.58	1.52	1.55
Fat	1.00	1.00	1.00	1.00	1.00	1.00
Vitamin & trace-mineral premix [A]	0.50	0.50	0.50	0.50	0.50	0.50
Dynamate (Potassium Chloride)	0.40	0.40	0.40	0.40	0.40	0.40
Salt	0.40	0.40	0.40	0.40	0.40	0.40
DL-Methionine	0.18	0.18	0.15	0.16	0.09	0.10
Coccidostat	0.06	0.06	0.06	0.06	0.06	0.06
Copper sulfate	0.05	0.05	0.05	0.05	0.05	0.05
Total	100.00	100.00	100.00	100.00	100.00	100.00
Calculated Analysis						
Metabolizable energy, kcal/lb	1,232	1,259	1,281	1,303	1,327	1,349
Crude protein, %	32.00	30.00	28.00	26.00	24.00	22.00
Arginine, %	2.42	2.26	2.09	1.93	1.77	1.60
Methionine, %	0.68	0.65	0.60	0.58	0.48	0.46
Methionine + cystine, %	1.16	1.10	1.02	0.97	0.85	0.80
Calcium, %	1.10	1.00	1.00	1.00	1.00	1.00
Available phosphorus, %	0.52	0.52	0.52	0.52	0.50	0.50
Sodium, %	0.16	0.16	0.16	0.16	0.16	0.16

[A] Supplied per lb of diet: vitamin A – 5,000 IU, vitamin D – 1,000 ICU; vitamin E – 6.25 IU; vitamin B_{12} – 0.004 mg; riboflavin – 2.50 mg; niacin – 17.50 mg; biotin – 0.025 mg; d-pantothenic acid – 7.50 mg; choline – 200 mg; menadione – 1.25 mg; folic acid – 0.25 mg; pyridoxine – 1.50 mg; thiamine – 1.5 mg; iodine – 1 mg; copper – 1.15 mg; zinc – 25 mg; iron – 11.25 mg; manganese – 25 mg; selenium – 0.023 mg.

Table 3. Composition of diets suggested for Bobwhite quail breeders

Ingredients, % "AS-IS"	Breeder Diet (1)	Breeder Diet (2)
Corn, 8.5% CP	39.15	49.07
Soybean meal, 48.5% CP	50.49	40.48
Limestone	6.31	6.33
Biofos (Dicalcium Phosphate)	1.56	1.63
Fat	1.00	1.00
Vitamin & trace-mineral premix [A]	0.50	0.50
Dynamate (Potassium Chloride)	0.40	0.40
Salt	0.40	0.40
DL-Methionine	0.14	0.15
Copper sulfate	0.05	0.05
Total	100.00	100.00
Calculated Analysis		
Metabolizable energy, kcal/lb	1,205	1,249
Crude protein, %	28.00	24.00
Arginine, %	2.11	1.77
Methionine, %	0.58	0.54
Methionine + cystine, %	1.00	0.90
Calcium, %	2.80	2.80
Available phosphorus, %	0.52	0.52
Sodium, %	0.17	0.17

[A] Supplied per lb of diet: vitamin A – 5,000 IU, vitamin D – 1,000 ICU; vitamin E – 6.25 IU; vitamin B_{12} – 0.004 mg; riboflavin – 2.50 mg; niacin – 17.50 mg; biotin – 0.025 mg; d-pantothenic acid – 7.50 mg; choline – 200 mg; menadione – 1.25 mg; folic acid – 0.25 mg; pyridoxine – 1.50 mg; thiamine – 1.5 mg; iodine – 1 mg; copper – 1.15 mg; zinc – 25 mg; iron – 11.25 mg; manganese – 25 mg; selenium – 0.023 mg.

Pre-Mix

Mixing feed on the farm may be an option for producers who want to reduce cost, but it requires specific equipment and additional labor. One approach would be to mix a certain amount of corn and soybean meal with a commercial premix rather than attempting to mix a vitamin premix and mineral premix separately due to the small volume of the micro ingredients needed. If a producer chooses to mix feed at the farm, the commercial premix must contain an adequate amount of minerals and vitamins for optimum growth and health. Premix recommendations are presented in Table 4.

Non-Nutrient Feed Additives

Anti-microbial agents are compounds given in relatively low concentrations that suppress the growth of pathogenic microorganisms. This class of compounds includes antibiotics and coccidostats. Antibiotics are naturally occurring substances produced by yeast, molds and other microorganisms; coccidostats are a group of chemical compounds used to prevent coccidiosis (an infection caused by intestinal parasites).

Only two anti-microbial agents have been approved for Bobwhite quail (Table 5). Monensin

is the most commonly used coccidostat. In addition to the anti-microbials, including a probiotic or Direct-Fed Microbial (DFM) appears to be promising in improving health status. DFMs are naturally occurring microbials that enhance the population of beneficial microorganisms in the intestinal tract. Research from North Carolina State University has indicated that supplementing Bobwhite quail diets with PrimaLac (a DFM) reduced mortality, increased body weight gain and improved feed efficiency. Another feed additive that can be advantageous in reducing pathogenic microbial populations is copper sulfate, a dietary source of copper that, when present in high concentrations, is known to have anti-microbial activity.

Table 4. Composition of mineral and vitamin premix for Bobwhite quail

Nutrient	Unit	Potency/lb	Source
Vitamin A	I.U.	1,000,000	Vitamin A Acetate
Vitamin D	I.U.	200,000	Vitamin D_3
Vitamin E	I.U.	1,250	di-Alpha Tocopheryl Acetate
Vitamin B_{12}	mg	0.80	Vitamin B_{12}
Riboflavin	mg	500	Riboflavin
Niacin	mg	3,500	Niacin
d-Pantothenic Acid	mg	1,500	Calcium Pantothenate
Choline	mg	40,000	Choline Chloride
Menadione	mg	250	Menadione Dimethylpyrimidinol Bisulfite
Folic Acid	mg	50	Folic Acid
Thiamine	mg	300	Thiamine Mononitrate
Pyridoxine	mg	300	Pyridoxine Hydrochloride
d-Biotin	mg	5.0	d-Biotin
Selenium	mg	4.54	Sodium Selenite
Manganese	g	5.00	Manganese Sulfate
Iron	g	2.25	Ferrous Sulfate
Copper	g	0.23	Copper Sulfate
Iodine	g	0.20	Calcium Iodate
Zinc	g	5.00	Zinc Sulfate

Table 5. Suggested feed additives for Bobwhite quail [A]

Trade Name	Drug	Dietary Inclusion Rate	Comments
BMD 50	Bacitracin Methylene Disalicylate	0.02%	Give until 5 weeks of age for growth rate and feed efficiency.
Coban-60	Monesium	0.06%	For the prevention of coccidiosis.
PrimaLac	Probiotic	0.1%	For growth rate and feed efficiency; to minimize mortality.

[A] Suggested recommendations based on the 1999 Feed Additive Compendium. Check the most current edition for modifications with drug usage and product approval.

Ingredient Quality

Feed storage time and temperature can influence the quality of mixed feed. Vitamin oxidation can occur with feed stored for long periods of time, so use feed within three to four weeks.

High grain moisture coupled with warm conditions can stimulate mold production. Corn raised under stress conditions (drought) is prone to mold growth. Some molds can produce a class of compounds referred to as mycotoxins, which can adversely affect poultry growth and are known to be toxic. Grain samples suspected of containing a high content (>20 ppb) of aflatoxin – a mycotoxin – should be sent to a Georgia Diagnostic Laboratory for aflatoxin determination before mixing feed. If samples exceed 20 ppb aflatoxin, use another source of grain.

Summary

- Proper nutrition is one of the most important factors in producing high quality flight birds.
- Feed represents the greatest cost for producing flight-ready quail.
- Compromising the amount of nutrients in the diet can be a costly mistake leading to poorly feathered birds, increased disease susceptibility and poor flight characteristics, especially when birds are either overweight or under nourished.

Learning for Life